

**The Attack Helicopter Battalion:
Ready for the 60's or the 90's?**

**A Monograph
by
Major James E. Simmons
Aviation**



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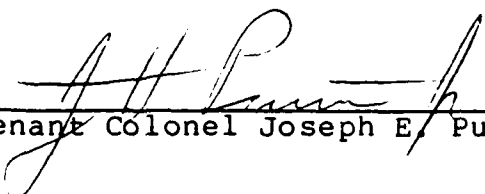
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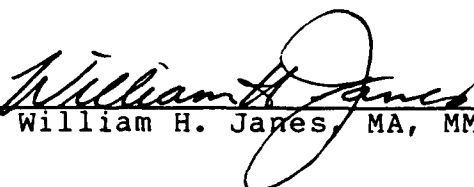
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ABSTRACT

The Attack Helicopter Battalion: Ready for the 60's or 90's?
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The study uses a scenario that commits the attack battalion to destroy the independent tank regiment of an attacking Soviet army. The engagement area is seventy kilometers from the forward line of friendly troops (FLOT).

Conclusions of the study indicate that the attack battalion has the capability to execute the raid as a part of deep operations but does not have the ability to destroy the independent tank regiment on one mission. The study further identifies serious shortfalls in the currently fielded scout helicopter's ability to execute its doctrinal mission.

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INTRODUCTION.

This study examines the organization of the attack helicopter battalion and its ability to conduct independent deep operations in support of the division and corps. The paper answers the question: To what extent is the attack helicopter battalion organized to successfully conduct independent deep operations against a Soviet styled threat on a conventional mid to high intensity battlefield in Europe? For the purpose of this paper, independent deep operation is defined as: Operations conducted by Army units forward of the forward line of troops (FLOT) and short of the corps fire support coordination line (FSCL).

FM 100-5, Operations, the Army cornerstone manual for tactics and operations, stresses the importance of deep operations at all echelons to ensure advantage in subsequent engagements and to create the conditions for victory. These include: deception; deep surveillance and target acquisition; interdiction; command, control and communications countermeasures; and command and control.¹

The interdiction portion of the doctrine is the primary subject of this study. The primary assumption is that the Air Force does not have sufficient assets to routinely conduct joint deep operations at the time and place desired

by division and corps commanders. This assumption is not based on a detailed analysis of Air Force capability, but on the different and competing requirements of the two services.

The Army primarily conducts interdiction operations at night and focuses on the destruction of enemy forces.² The Air Force has limited capability to support these operations because of the lack of night fighting capability currently in the Air Force inventory. The night fighting assets that the Air Force does have are dedicated to destroying the enemy air power. During the day, the Air Force gains air superiority and conducts counterair strikes to destroy enemy airfields and command and control. The remaining assets are apportioned to battlefield air interdiction (BAI) and close air support (CAS) to assist ground forces in the destruction of enemy forces.³ To accomplish these operations, the Air Force commits assets with electronic warfare and strike aircraft in packages to enhance the chances for success. This leaves few aircraft to support Army deep night operations.

While a detailed analysis has not been conducted to support this assumption, it is a plausible scenario that the Army should examine. The examination should determine the Army's capability for deep operations without dedicated support from the Air Force.

The focus of this study is a deep attack scenario in Europe on a mid to high intensity battlefield. The attack is conducted against a moving independent tank regiment (ITR) of a Soviet army. The attack occurs in an engagement area 70 kilometers forward of the FLOT. The attacking force is one attack helicopter battalion. The penetration occurs through a motorized rifle division or a tank division.

Two criteria will be used to determine if the attack helicopter battalion is organized to successfully conduct independent deep operations. The criteria are:

1. Does the attack helicopter battalion have the ability to penetrate the FLOT and maneuver through the Soviet ADA system to reach the battle position (BP)? The standard for this evaluation is a comparison of the doctrinal tasks the battalion must accomplish to cross the FLOT and maneuver to the BP with the doctrinal capabilities of the Soviet air defense to acquire and defeat the attack.

2. Does the attack helicopter battalion have the technical capability to detect, designate, and destroy the target? The standard of evaluation is a comparison of the doctrinal tasks necessary to detect, designate, and destroy the target with the technical capabilities of the battalion to detect, designate, and destroy the target.

Prior to examining the evidence, it is appropriate to acquaint the reader with the history of the attack battalion. This history explains the origin and the concept of employment envisioned for the battalion.

CHAPTER ONE

HISTORY

Armed helicopters were experimented with in the late 1950's, but did not receive any formal consideration in large organizations until the Secretary of Defense directed the Army to conduct the Tactical Mobility Study in 1962. The purpose of the study was to determine how the Army could increase its mobility to gain an advantage over potential adversaries. The recommendation of the board, headed by LTG Hamilton H. Howze, included a sweeping reorganization of the Army with the helicopter becoming the primary system for moving men and equipment.

The basic unit selected for increased mobility and combat capability was the division. The board felt the division was the smallest organization that encompassed all combat arms and services and was capable of conducting extended combat operations when supported by higher echelons.*

The air assault division design had the essential elements of striking power to include: maneuver forces, reconnaissance forces, firepower, communications, and support. Its organic reconnaissance and fire support permitted the execution of completely integrated airmobile

task force missions.⁶

The fire support for the division consisted of three direct support artillery battalions equipped with 105mm howitzers, one Honest John battalion, and one aerial rocket artillery battalion. The aerial rocket artillery battalion consisted of 36 armed helicopters capable of firing 2,500 rockets per mission with a 75% aircraft availability rate.⁶ The mobility and responsive firepower of the battalion satisfied the ground commander's desire for rapid and lethal fire support during high tempo operations.

Another organization that was recommended by the Howze Board was the air cavalry combat brigade (ACCB). The brigade was described as an air fighting unit which destroyed or punished the enemy by aerial maneuver, surprise and heavy application of firepower delivered from attack helicopters, air delivered riflemen and tank killer teams.⁷ The Howze Board believed this organization was capable of supplementing the capabilities of a division in crossing obstacles, meeting engagements, and delaying operations. Its primary purpose was to destroy mechanized and armored forces by air and ground delivered fire.⁸

Both types of organizations recommended by the Howze Board were involved in the Vietnam Conflict. The helicopter proved itself on the battlefields of Vietnam and while not

assuming the overpowering position envisioned by the Howe Board, the helicopter continued to receive major considerations in subsequent studies conducted to improve the combat capabilities of the Army.⁹

This is evident in the briefing given on Air Mechanization by the Institute of Advanced Studies in December, 1968. The Institute was addressing the Army structure for the 1980-85 period. There was a recognized need for increasing the mobility of the ground forces to allow the Army to defeat the most dangerous threat i.e., the Soviets on a European battlefield. The helicopter appeared to be part of the answer.

The briefing stressed the hostile environment that would face the helicopter. Even with this assessment, the study concluded that the helicopter was the best alternative to increase Army mobility and firepower. The Institute recommended increasing the numbers of air cavalry combat brigades, placing one in each division. This organization was to orient on the destruction of enemy armored and mechanized formations through aerial maneuver and the use of antitank weapons. The briefing stated that the tank would be replaced by the helicopter as the primary antitank system and the aerial rocket artillery battalion should remain the primary area fire weapon in the direct fire configuration in

support of fast moving mechanized attacks.¹⁰

It is important to note at this point, that while both of these studies stressed the importance of the mobility and firepower potential of the helicopter, neither envisioned helicopter organizations conducting operations outside the combined arms team concept. Close combat by infantry and armored formations was required to win battles. The helicopter only improved the ability of the ground forces to accomplish this goal.

At the close of the Vietnam Conflict, the Army was forced to examine its mission, doctrine, and organization in reference to the world wide threats that faced our nation. Our heavy forces needed modernization and a coherent doctrine was needed to move the Army out of the jungles of Southeast Asia and back into the modern conventional/nuclear battlefield.

One thing that resulted from this effort was the 1976 version of FM 100-5, Operations, that established the defense as the stronger form of war and the requirement for the Army to master the skills to fight outnumbered and win. This necessitated tactical mobility. Again, the helicopter surfaced as a weapon system that was capable of moving rapidly from one defensive sector to another and assisting the ground forces in defeating the attacking enemy.¹¹

In September 1978, General Donn Starry, Training and Doctrine Command (TRADOC) Commander, redirected the effort of a study that had been underway for two years on the structure of the heavy division of the future. The results of the Division 86 study were approved by the Chief of Staff, General Edward C. Meyer, in October 1979. This reorganization was aimed at creating heavy divisions that were capable of executing the 1976 doctrine in FM 100-5.¹²

The Division 86 aviation structure was based on the results of the Air/Ground Cavalry and the Attack Helicopter Organization studies completed in November 1977. These studies stressed the ability of the attack helicopter to add tank killing firepower to the ground oriented active defense.¹³ In April 1978, the TRADOC Commander directed the Armor School to examine an organization that centralized all aviation assets under one commander. By February 1979, the Armor School, working with the Aviation School, had developed the air cavalry combat brigade. The organization established the maneuver role for the attack helicopter and removed it from the realm of fire support. The brigade initially was organized around three air cavalry squadrons and a close support aviation battalion. The divisional cavalry squadron remained under division troops. This organization was refined when the Chief of Staff expressed concern about the lack of

air reconnaissance in the cavalry squadron. The brigade initially recommended had a strength of 2544 and included the division cavalry squadron, a combat support aviation battalion, and two attack helicopter battalions.¹⁴

These two battalions were each to be equipped with 21 attack helicopters, 12 scout helicopters, and 3 utility helicopters. The influence of the Armor School is important and can be clearly seen in the mission statement of the attack helicopter battalion: "The attack helicopter battalion finds, fixes, and destroys enemy armor and mechanized forces as an integral member of the combined arms team."¹⁵

Later doctrinal manuals added: "The attack battalions are combat maneuver units and not CAS or fire support units. Therefore, they must be integrated into the commander's tactical maneuver plan along with other maneuver units."¹⁶

The doctrine clearly indicated a maneuver role for the attack battalion, but just as clear, was the intent for the battalion to operate as a member of a combined arms team which included armor, infantry, artillery, and air defense artillery. Thus, by 1980 a force structure had been approved to execute the 1976 doctrine.

The introduction of the 1982 version of FM 100-5 restored the offense to Army doctrine. The new doctrine also established a battlefield that included deep, close, and rear operations. Conceptually, the attack helicopter battalion appeared to offer potential in waging the deep portion of AirLand Battle.¹⁷

CHAPTER TWO
ORGANIZATION AND DOCTRINE
ATTACK HELICOPTER BATTALION

ORGANIZATION

The AH-64 equipped helicopter battalion is authorized 264 personnel. The unit is commanded by a lieutenant colonel with majors as the executive officer and operations officer (S3). The unit has a complete staff with captains serving as S1, S2, and S4. The Division Artillery provides a fire support officer to plan and coordinate artillery support for the battalion.

The organic companies of the battalion consist of a headquarters company, a service company, and three attack helicopter companies. Each attack company consists of a headquarters, one scout platoon (four aircraft), and one attack platoon (6 aircraft).

The battalion is capable of maintaining a 75% operational readiness rate, which means the battalion can normally field 13 or 14 attack helicopters daily. Each aircraft can carry a variety of munitions which includes rockets (antipersonnel, anti-material), missiles (antitank), and a turret mounted chain gun (immediate suppression and self protection). The scout helicopters are unarmed, while

the three utility aircraft have door mounted machine guns for self protection.¹⁹

DOCTRINE FOR DEEP ATTACK HELICOPTER OPERATIONS.

FM 1-112 states that there are three possible forms of deep operations for the attack helicopter battalion. The three operations are listed as: Operations of short duration (raid), operations to secure a deep objective (deliberate attack), and operations to continue the attack (exploitation).¹⁹ Since the most frequently planned and executed deep attack operation is the raid; it will be the subject of evaluation.²⁰

A raid is defined as an attack into enemy held territory for a specific purpose other than gaining or holding terrain. The purpose of a raid may be to destroy a specific unit, installation, or class of military material.²¹

The doctrine goes on to specify two key ingredients for the raid. First in importance is the objective. The objective may be listed as terrain, but is most often listed as a force tied to a specific point of ground. For the remainder of this study, the objective will be evaluated by the second portion of the criteria which is the ability of the attack battalion to detect, designate, and then destroy the target or "objective".

Second in importance is timing. Timing is critical

because the battalion is normally attempting to strike a moving formation. The doctrine states that it is preferable to conduct the entire operation on one fuel load during the hours of darkness.²² For the remainder of this study, timing will be evaluated by both portions of the criteria: One, the ability to detect the target in a timely manner to allow the battalion to destroy the threat. Two, the ability of the battalion to penetrate the Soviet air defenses, maneuver to the target area with the precision needed to execute the attack, and arrive with sufficient combat power to destroy the enemy.

CHAPTER THREE

PENETRATION AND MANEUVER

In this chapter, the ability of the attack battalion to penetrate the Soviet force and maneuver to a BP 70 kilometers from the FLOT is evaluated. There are three methods of executing the penetration. These are: penetration by fire, penetration by force, and penetration by stealth.²³

Penetration by fire uses the massed fires of artillery, ground units in contact, other attack helicopters, or USAF aircraft to create a gap in the enemy's defenses.²⁴ This method requires considerable coordination outside the attack helicopter battalion to execute.

Penetration by force is used when there is a low enemy reaction capability. It usually involves units organic to the aviation brigade to attack and create a gap for the attack battalion to pass through.²⁵

Penetration by stealth involves deception, electronic warfare measures, and terrain to mask the movement of the attack battalion from the enemy.²⁶ This method may be used successfully if there has been an established pattern of friendly operations.

Penetration by fire is the most frequently used technique and is the basis for evaluating the ability of the

attack battalion to penetrate the Soviet combined arms army.²⁷ The first step in planning the penetration is an examination of the Soviet threat.

THE SOVIET THREAT TO THE DEEP ATTACK.

The objective of the Soviet tactical air defense is to reduce the effectiveness of enemy air attacks. The Soviets force the attacking aircraft to deliver their ordnance prior to their most effective release point or destroy the attacker. To accomplish this, the Soviets deploy a fully integrated air defense system which includes missiles, ADA guns, and fire from other ground systems.

In this study's scenario, the target force is the ITR of a Soviet combined arms army. To reach a position to engage the ITR, the battalion must penetrate and maneuver through the attacking army. The typical army consists of four or five divisions and the normal supporting elements to include a surface to air missile brigade.

THE PENETRATION VS REGIMENTAL AND DIVISIONAL ADA.

The area in which the penetration occurs begins at the FLOT and extends to the rear of the first echelon regiments of the first echelon division. This area extends for a distance of 10 to 30 kilometers.

The first task of the attack battalion is to determine where they will execute the penetration. The battalion

commander is assisted in the planning phase by the division or corps deep targeting cell. Some areas that are considered in the decision are the known location of ADA radars and ADA systems, the strength of the unit to be penetrated, fire support available, electronic warfare (EW) assets available, and time. The planning normally requires 24 to 48 hours.^{2a} The battalion uses three passage points for the penetration. Each passage lane is one kilometer wide and the lanes are separated by three to five kilometers. It is better if all three passage points are in one US brigade's sector. This facilitates coordination for the passage.

Facing the penetration are two or three attacking regiments of the first echelon division. This is based on the normal frontage for an attacking regiment of three to eight kilometers. For the purpose of this study, the attack will penetrate two regiments.

Each of these two regiments have their own organic ADA battery. These units are organized with the ZSU-23-4 and SA-13 or the 2S6 and BMP-2.

ZSU-23-4 AND SA-13 BATTERY.

The ZSU-23-4/SA-13 battery consists of four ZSU-23-4 and four SA-13. The ZSU-23-4 is equipped with four 23mm air defense guns per vehicle. Each vehicle is also equipped with its own radar to acquire and track low flying aircraft. The

GUN DISH radar transmits on a very narrow band, making it difficult to detect and evade. The system is effective to a range of 2,500 meters and has the capability to fire while on the move. It fires 800 to 1,000 rounds per minute and carries 2,000 rounds on the vehicle. Each vehicle has its own resupply truck which normally follows one to two kilometers behind the ZSU-23-4. The radar is capable of acquiring targets at altitudes above ten meters.²⁹

The SA-13 is normally deployed in the same battery as the ZSU-23-4. The SA-13 is a system of vehicle mounted IR homing missiles. The gunner must visually acquire the target and then launch the missile. Each vehicle carries four missiles mounted and has resupply capability within the battery.³⁰

The ZSU-23-4 is normally located to the immediate rear and on the boundaries of the lead attacking units. The SA-13 is located further to the regiment's rear protecting the regimental CP and the trains.³¹

2S6 AND BMP-2 BATTERY.

The 2S6/BMP-2 battery consists of six 2S6 and six BMP-2. The six 2S6, that are replacing the ZSU-23-4, are more capable systems. The 2S6 mounts multiple 30mm anti-aircraft guns and multiple air defense missiles on the same chassis. The vehicle has its own acquisition and tracking radar, and

has a 3000+ meter range. The acquisition system can detect targets at altitudes above ten meters.³²

The six BMP-2 vehicles that are the other portion of this new battery have a turret mounted 30mm gun and three dismount SA-16 launchers. The 30mm system requires visual acquisition of the target. This restricts the capability of the system against moving targets at night. The SA-16 is a shoulder fired IR homing missile. The gunner must visually acquire the target with this system prior to launch.³³

Separate but overlapping the regimental ADA battery is the divisional surface to air missile regiment. This organization is organized with a headquarters, one target acquisition battery, five missile firing batteries, one technical battery, one motor transport company, and one maintenance company. The unit is normally equipped with the SA-6 missile, but may be equipped with the SA-8. Each firing battery has four launchers giving the regiment 20 total. The regiment also has 21 SA-16 missile launchers to provide close in air defense for protection of the regiment.³⁴

The SAM regiment has three radar systems to acquire targets, determine height of targets, and control the fires of the SA-6. These are LONG TRACK for acquisition, THIN SKIN for height and STRAIGHT FLUSH for fire control. Friendly EW is able to locate these systems and plot the order of

battle.³⁵

The SA-8 regiment is organized in a like manner, but with different radar and, of course, a different missile. It is equipped with the LONG TRACK or FLAT FACE for acquisition, THIN SKIN for height, and LAND ROLL for fire control. Friendly EW is able to locate the first two, but the LAND ROLL is activated only during engagements to provide guidance for the missile to the target.³⁶

During Soviet offensive operations, the majority of the SAM regiment is located from five to ten kilometers from the line of contact and locates on the borders of units they are protecting. They also protect the division artillery group and the division command post.

There are 100+ SA-7/14 shoulder fired missile launchers throughout the units in the division for close in protection against low flying aircraft.³⁷ These systems require visual acquisition. The SA-7 has limited capability to engage approaching aircraft because of the IR seeker head. The SA-14 has improved head on capability but still requires the gunner to visually acquire the target prior to missile launch.³⁸

The Soviets also train to defeat air attacks by using the direct fire weapons on their armored vehicles. There are 1,834 weapon systems in a motorized rifle division and 1,765

weapon systems in a tank division that can effectively engage a helicopter.³⁹ These systems require the gunner to visually acquire the target and then direct the weapons fire toward the target. While the systems are effective against a hovering or stationary helicopter, they are not effective against a helicopter moving at 100 to 140 knots per hour at night.

THE PENETRATION.

The attack helicopter battalion uses all available assets to make the penetration. Since this attack is a priority for either the division or corps commander, it is safe to assume that the battalion will receive priority of artillery and EW support during the penetration. Assuming the division is being supported by one corps artillery brigade, the battalion could have as many as six artillery battalions to suppress the known and suspected locations of enemy ADA radars, ADA systems and concentrations of troop units. The artillery has to be pre-planned. The primary method of executing the fire plan is by voice calls on a quick fire net. This is necessary because the battalion does not have the organic capability to interface with the TACFIRE system of the artillery. Since the battalion is the priority of the division or corps for this period, the artillery commander may allocate one or more OH-58Ds to coordinate the

tures of the artillery with the maneuver of the attack battalion. If the OH-58D is in support of the battalion, it will not accompany the battalion on the far side of the FLOT.⁴⁰ The EW assets locate enemy radar and jam artillery and command and control communication nets. The other systems mentioned in the doctrine are difficult for the attack battalion commander to control and direct and are not normally used.⁴¹

Considering the mobility of the Soviet ADA systems, the fact that the vehicles are lightly armored, and the capability of EW units to pinpoint the radars, the artillery is capable of suppressing 50% of the ADA systems out to the maximum range of the supporting tube artillery.⁴² This distance is 15 kilometers from the FLOT. This leaves four radar directed gun systems and four IR homing missile systems in the two lead regiments. There are also five radar directed SA-6/8 in the penetration sector that are capable of acquiring and engaging the attack helicopter battalion.⁴³

MISSILES.

Since the attack is conducted at night, the SA-13 systems are limited in their ability to visually acquire the aircraft.⁴⁴ Any missiles that acquire the helicopters are defeated by the ALQ 144 IR missile jammer that is mounted on the AH-64 and the UH-60.⁴⁵ These two facts make the SA-13 a

minimum threat to the attack battalion.

The five radar directed missile systems of the division SAM regiment will acquire three to five of the aircraft of the attack helicopter battalion.⁴⁶ The AH-64 and UH-60 have the APR 39, radar detector, that indicates active radar and their location relative to the position of the aircraft.⁴⁷ This gives the battalion additional capability to maneuver around firing systems without coming into range of the missiles. The aircraft are also equipped with the ALQ 136 radar missile jammer. This system provides protection to the aircraft by confusing the guidance systems of radar missiles.⁴⁸ The aircraft also have chaff dispensers to assist in confusing the radar missiles.⁴⁹ Using these systems effectively negates the missile systems.

RADAR DIRECTED AIR DEFENSE GUN SYSTEMS.

This leaves four radar assisted gun systems. Each of these systems is capable of firing 2,000 rounds at the aircraft of the battalion. With their normal distribution throughout the regiments, each of the four systems is able to acquire at least one aircraft. Using a 50% probability of hit, two aircraft will be hit.⁵⁰ These aircraft will not necessarily be destroyed. The AH-64 and UH-60 aircraft were designed to withstand hits of up to 23 mm and return to friendly lines. The OH-58C does not have this capability.⁵¹

The battalion has limited countermeasures to employ against the radar directed gun systems. The APR 39, which gives the radar location, and the speed and low altitude of the aircraft are the only countermeasures the battalion can use to protect itself from the guns.

If the Soviet ADA batteries are equipped with the 2S6 and the BMP-2, there are six radar directed gun/missile vehicles and six non-radar directed gun/missile vehicles that are capable of acquiring the battalion.⁵² The BMP-2 and its SA-16 both require visual acquisition.⁵³ If they are capable of acquiring the battalion, they will be defeated by the terrain flight techniques employed by the battalion and the ALQ 144 IR jammer.

The 2S6 are employed in the same manner as the ZSU 23-4. These systems are able to acquire and engage the aircraft of the battalion.⁵⁴ Using a 50% probability of hit, three aircraft will sustain hits.⁵⁵ Since the 30mm gun is more lethal than the 23mm, the probability of catastrophic damage is increased. Thus, the battalion leaves the initial penetration area with losses of two to three aircraft.⁵⁶

DEEP MANEUVER VS DIVISIONAL AND ARMY ADA.

Deep maneuver begins at the rear of the first echelon regiments and extends to the release point of each of the three routes. This area extends from 30 to 65 kilometers

from the FLOT.

Facing the battalion are the second echelon regiments, second echelon divisions and the SAM brigade. The doctrinal template of the army allows the battalion to plan its route to avoid the majority of the second echelon divisions. This is offset by the inability to suppress any of the ADA systems with tube artillery. If possible, the battalion will avoid all of the second echelon forces. The probabilities are, however, that the battalion will encounter the air defenses of one second echelon regiment of the first echelon division and one of the second echelon divisions. It is also possible that the battalion will encounter elements of the army artillery group and the army SAM brigade. This gives the Soviets 20 to 28 radar directed gun systems and 40 to 120 missile firing systems to engage the battalion.⁵⁷

The planned route of the battalion avoids 50% of the ADA.⁵⁸ The on board radar detector gives the battalion the capability to maneuver around 50% of the radar systems that they detect along their planned route.⁵⁹ This is possible because of the tactical navigation system that is on both the AH-64 and the UH-60. This system gives the crew the ability to input ten different checkpoints in the navigation computer. The system then provides the crew with their current location in relation to the next check point. If it is

necessary to bypass a point because of the threat, the computer automatically computes the best heading to the next check point. The crew is then free to monitor the situation outside the aircraft and the indications of threat radar on the APR 39.

Five to seven radar directed gun systems and ten to thirty missile systems remain. All but five of the missile systems will require visual acquisition and are IR homing. Once again, they are defeated by terrain flight, darkness, and countermeasures employed by the ALQ 144. The five that have radar acquisition are defeated by the ALQ 136 jammer and chaff. With a 50% hit probability, the remaining radar directed guns will hit three to four aircraft.⁸⁰ Thus, the battalion will reach the attack position with 18 to 21 total aircraft. Applying these losses proportionally, the battalion reaches the release point with ten to twelve AH-64s, two UH-60s, and six to seven OH-58s.⁸¹

CHAPTER FOUR
DETECT, DESIGNATE, AND DESTROY

In this chapter, the ability of the attack battalion to detect, designate, and destroy the target is evaluated.

DETECT.

The detect portion of the operation begins at the release point on each of the three battalion routes and continues until the battalion engagement is completed. Doctrinally, this is the mission of the aeroscout of the attack battalion. Specifically, the mission of the aeroscout scout is to see the battlefield, find the enemy, and coordinate with the AH-64 for the destruction of the enemy.⁸² Seeing the battlefield and finding the enemy are in the category of detect. The doctrinal techniques used to perform the aeroscout mission tasks are based on experience that dates back to the experiments of the 1960's and combat experience of the Vietnam Conflict.

Upon reaching the release point (RP) on the route, the scout conducts reconnaissance of the BP to ensure security for the attack helicopters. Once that is complete, the scout moves forward to position himself where he can observe the engagement area without compromising his own position to the enemy. If the enemy does not move into the EA within the

time programmed for the attack, the scout moves forward to gain contact with the enemy force.

After contact is established, target handover is executed with the attack aircraft and the engagement begins. Doctrinally, the scout designates targets for the attack helicopter or moves to a screen position to provide security during this portion of the deep attack.⁵³

The currently fielded scout aircraft is the OH-58C. Based on Army decisions, this is the scout helicopter that will continue to serve in attack helicopter battalions through the 1990's.⁵⁴ This aircraft is not capable of performing the doctrinal mission for a scout at night on a deep operation.

First, the aircraft lacks sufficient night flying capability. The aircraft is flown at night in the terrain flight mode using pilot worn night vision devices. This system is so inferior that the Aviation Center suggests that the aircraft should not be flown in mixed flights with the AH-64 for fear of mid air collisions.⁵⁵

Second, the aircraft lacks a tactical navigation system. This means that the entire operation from the assembly area to the battle position and back must be accomplished using a hand held map and a red lens flash light for navigation. This makes it difficult for the scout to perform his

reconnaissance accurately.

Third, the aircraft is limited in its ability to actually detect the enemy. The acquisition range of the OH-58C at night is equal to the range of the night vision devices worn by the aircrew. This equates to a distance of approximately 800 meters in the Nap-of-the-Earth mode of flight. This makes it difficult for the scout to detect the enemy without being seen or heard.⁶⁶

DESIGNATE.

Doctrinally, it is the mission of the scout to designate the target for the AH-64. This involves projecting laser energy onto the target. This is necessary because of the homing characteristics of the Hellfire missile. The missile seeker detects the laser energy and then flies to the target and destroys it. The OH-58C does not have the capability to project laser energy onto the target.⁶⁷

DESTROY.

The Hellfire missile launched from the AH-64 is capable of destroying Soviet tanks. As mentioned earlier, the missile seeker flies to a coded laser energy spot on the target and destroys it. The AH-64 can designate its own target, but the preferred method of launch is from a remote designator. This designator can be another AH-64. The aircraft and the

missile combination can defeat targets from a range of seven kilometers.⁶⁸

ALTERNATIVE TECHNIQUES.

Since the scout helicopter is not capable of detecting targets from a safe range and is not capable of designating targets, alternative methods of employment are used to detect, designate, and destroy the target. The most frequently used technique by current battalion commander's is to leave the scout helicopter on the friendly side of the FLOT to assist in the return passage of lines and reorganize the battalion with other aircraft detecting and designating targets.⁶⁹

DETECT.

When the attack battalion commander elects to conduct the attack with only AH-64s he must assign the traditional scout missions to some of the AH-64 crews. This implies that the commander has conducted training to ensure the aircrews have the capabilities necessary to perform the scout tasks. The result is a task organization of two companies with five attack helicopters and one company with four attack helicopters. In this scenario, the scout AH-64 will move ahead of the remainder of their companies reconning the BP to determine the security. Once satisfied that the position is capable of masking the attack aircraft from the engagement

area, the scout will call the attack aircraft forward. The company normally operates in two platoons with two attack helicopters in the light platoon and two or three in the heavy platoon. Since the AH-64 is now performing as a scout this reduces the number of attack helicopters to one in the light platoon and one or two in the heavy platoon. Because of the reduced numbers, the end result is that the light platoon becomes the scout platoon and the heavy platoon becomes the attack platoon. As the attack helicopters move into the BP, the scouts move forward to detect the enemy. The AH-64 has the capability with its target acquisition and designation system to identify targets at ranges in excess of 3000 meters at night. The scout will continue to move toward the engagement area until he reaches a position in which he can clearly identify the terrain feature to which the raid is tied.⁷⁰ Once he identifies the target in the EA and he has been given the permission by the company commander to engage, he will conduct a target handover to the firing aircraft and prepare to designate.⁷¹

The scout picks locations to observe the engagement area that provides radar and visual backdrops to prevent the ITR from acquiring the aircraft. However, at such a close range the radar on either the ZSU-23-4 or the 2S6 will be able to acquire the helicopter. Given the size of the engagement

area (10 to 15 kilometers long and 3 to 4 kilometers wide), the fact that the ITR is moving, and the size of the AH-64, the ADA radar will detect one to three of the helicopters.⁷²

If engaged, the scout AH-64 can fire rockets for immediate suppression, or use the terrain to mask movement while he relocates. If he fires his rockets, he will reveal his position to the tanks and other armored vehicles in the column and in turn, can expect to receive fire from those systems as well. Since the scout AH-64 is at a hover or in very slow NOE flight, there is a better probability that he will be hit.

DESIGNATE.

The AH-64 has the capability to designate targets for itself or for other AH-64's. In this scenario, the commander has deployed scout AH-64s forward to detect and then designate targets for the remaining attack helicopters. There are several different options for firing the Hellfire missile. These include Lock on Before Launch, Lock on After Launch, and Autonomous.⁷³

With a remote designator, the most advantageous method for the attack helicopter is the Lock on After Launch. This allows the attack helicopter to remain masked while the missile climbs to altitude and picks up the laser spot. This method requires more coordination between attack and scout

crews and more time.⁷⁴

The Lock on Before Launch requires the Hellfire seeker to acquire the laser spot prior to the missile launch. This requires the attack helicopter to expose itself to the enemy's radar and direct fire systems. Normally the aircraft will be outside of the range of the ADA and direct fire systems. This also requires that the scout aircraft remain unmasked for a longer period to designate the target while the attack helicopter locks on the laser spot.⁷⁵

In the autonomous mode the aircraft designates for itself. This is a problem after the first engagement because smoke and dust on the battlefield may require the designating aircraft to move within 2,500 meters to get enough energy on the target for the Hellfire to "lock on".⁷⁶ This brings the aircraft into the range of the ZSU-23-4 and the 2S6.

During the designate phase, radars will acquire helicopters and engage those within range of their weapons. With only a 50% probability of hit, one or two scout AH-64 aircraft will be hit.

The enemy's ability to respond will be offset initially by the element of surprise, but as deep attack helicopter operations become routine the enemy will become better at countering them.

Timing is also critical during this phase. Each

engagement will take one to two minutes to execute once the targets are detected. With one AH-64 designating for two attack helicopters it will take 30 minutes minimum for the attack aircraft to expend their ordnance.⁷⁷

DESTROY.

There is no doubt that the AH-64 can destroy enemy armor. However, what is the capability for one attack battalion to destroy the ITR on a deep attack?

If the battalion conducts the operation without scouts, departs the assembly area with fourteen AH-64s, and does not suffer any losses in route, it does not have the capability to destroy the ITR. The main fighting power of the ITR is its 150 tanks. To effectively destroy the formation, 60% of the tanks have to be killed.⁷⁸ That equates to 90 tanks.

If each of the fourteen attack helicopters carries eight Hellfire missiles, 38 rockets, and 750 rounds of 30 mm ammunition, and the battalion scores 100% hits with its missiles and does not hit a single target twice, the battalion will destroy 112 tanks. Since it is impossible to score 100% hits and fire distribution is difficult at night, it is reasonable to deduce that the battalion will kill less than 112 tanks. A more realistic figure would be 32 tanks hit.⁷⁹ This is based on two helicopters functioning as scouts in each company and three attack helicopters in two

companies and two in the third functioning as attack aircraft. The scout helicopters will suppress and destroy the ADA that is engaging them but will not kill tanks. Each of the eight helicopters that are engaging tanks will kill four each for the total of 32. This gives the battalion a 50% probability of hit and takes into consideration the difficulties of detecting the enemy, maintaining a good laser designation on the enemy, and the difficulties of fire distribution.⁹⁰

This does not equate to the destruction of the ITR. It may, however, delay the arrival of the ITR into the close fight and if this attack battalion or others are employed against the same target again, the ITR may be destroyed prior to reaching the close battle.

CHAPTER FIVE
CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS.

This study examined two separate but related areas necessary for the attack helicopter battalion to successfully execute one type of deep attack, the raid. In each of the two areas evaluated the battalion has strengths and weaknesses. The study concludes that the currently fielded attack helicopter battalion has the capability to execute the raid with major limitations. Specifically, the battalion is unable to fully meet the requirements of the two areas evaluated in this paper.

The first area evaluated was the ability of the battalion to penetrate the FLOT and maneuver through the Soviet ADA system to reach the battle position. The second area evaluated was the ability of the battalion to detect, designate, and destroy the target.

In examining the ability of the battalion to penetrate the FLOT and maneuver through the Soviet ADA to reach the battle position, the study concluded that the attack battalion has the capability to execute this portion of the raid with limitations.

The first limitation is the inability to adequately suppress the ADA systems of the Soviet regimental ADA battery. The primary method of suppression is the use of rapid and responsive artillery fires. The inability of the battalion to interface with the artillery TACFIRE system makes the system awkward and difficult. The best opportunity for success is in the use of targeting intelligence developed by the EW assets to suppress the known ADA radars. This coupled with aircraft countermeasure systems eliminates both the regimental and division ADA missile systems. Since the radar on the ZSU and 2S6 is difficult to locate with EW assets, the radar directed gun systems have to be attacked using templated data. This will result in 50% of the radar directed gun systems acquiring and engaging the battalion.²¹ Any aircraft that are hit during this phase limits the effectiveness of the battalion once it engages the enemy ITR.

The second limitation is the inability to suppress radar directed gun systems during the deep maneuver phase. This is even more of a problem than at the FLOT because of the lack of tube artillery to suppress radars. This requires the battalion to plan its routes to avoid as many systems as possible.

In examining the ability of the battalion to detect, designate, and destroy the target, the study concludes that

the attack battalion has the capability to execute this mission with limitations.

The first limitation is the inability of the current scout helicopter to perform its doctrinal role under some conditions. The OH-58C cannot detect the enemy at night without flying to extremely close ranges. Also, the aircraft cannot designate the target with laser energy for the AH-64 to engage. Because of its lack of ability, commanders are choosing to leave the scout behind. This results in the security of the battle position being weaker and increases the vulnerability of the battalion.

The second limitation is the actual ability of the battalion to inflict enough damage on the target. The doctrine indicates that deep attack helicopter operations are a high risk for high payoff operations. There is no doubt about the high risk but the evidence indicates the high payoff is not there. The loss of 32 tanks or even 50 tanks is not enough loss to keep the ITR out of the battle. Using the data developed in this study, the end result is the trading of one attack battalion for one ITR.²²

RECOMMENDATIONS.

1. The Army should field a scout helicopter that is capable of executing its doctrinal tasks at night in conjunction with the AH-64. The currently fielded OH-58D

meets the majority of the requirements to perform the scout mission. The aircraft has an excellent tactical navigation system. It is capable of detecting and designating targets outside the range of the threat ADA and it is capable of interfacing with the TACFIRE system of the artillery.

2. The Army should develop the capability to suppress enemy ADA radar. This capability should be an airborne system that is capable of being mounted on the AH-64 or UH-60. My preference is the UH-60. The aircraft has sufficient carrying capability to mount the system on the external stores system of the aircraft without sacrificing the performance of the aircraft.

There are few observations in this paper that have not been discussed and debated in the Army over the past several years. Each individual has his own opinion about our capability. This paper has attempted to quantify some of the arguments by comparing the weapon systems employed on both sides and their capabilities.

There is no doubt that the attack helicopter battalion has the potential to be successful in conducting deep operations. However, the problems and shortcomings identified in this paper are real. They limit the ability of the battalion to inflict damage on our adversaries, but worst, they limit the probability of survival of our aircrews.

While we have increased the tank killing capability of the battalion with the fielding of the AH-64, we have not completed the necessary up grade of the battalion to make the complete transition from the battlefields of Vietnam to the battlefields of the future.

Without changes, the attack helicopter battalion will continue to seek out the enemy of the 1990's with many of the same techniques used against the enemy of the 1960's.

ENDNOTES

1. Field Manual 100-5, Operations, Department of the Army, Washington D.C., 5 May, 1986, pp. 19-20.
2. Parker, Ellis D., Army Aviation, "Army Aviation Cross-Flot Operations", July, 1989, pp. 66-68.
3. U.S. Army Student Text, Air Force Reference Data, Fort Leavenworth, Kansas, May, 1987, pp. 4-11 to 4-13.
4. Howze, Hamilton H., Tactical Mobility Requirements Board Final Report, Fort Bragg, North Carolina, 20 August, 1962, p. 35.
5. Ibid., p. 37.
6. Ibid., pp. 38-39.
7. Ibid., pp. 39-40.
8. Ibid., pp. 40-41.
9. Emerson, Edwin W., Air Mechanization, Carlise Barracks, Pennsylvania, 23 December, 1968, p. 13. Greenway, John R. and Beltson, Richard D., Division 86 Final Report, Fort Leavenworth, Kansas, October, 1981, p. 1-1. Paulus, Jeffry A. and Haeker, Howard P., Air/Ground Cavalry 1980-1985, Volume I, U.S. Army Combined Arms Combat Development Activity, Fort Leavenworth, Kansas, p. 5.
10. Air Mechanization, p. 13.
11. FM 100-5, Operations, Department of the Army, Washington D.C., 1976, p. 1-1.
12. Division 86 Final Report, p. 1-1.
13. Air/Ground Cavalry Report, p. 1.
14. Division 86 Final Report, p. 2-16.
15. Ibid., p. 2-16.
16. Field Manual 1-112, Attack Helicopter Battalion, Department of the Army, Washington, D.C., 14 July, 1986, p. 1-1.
17. FM 100-5, Operations, Department of the Army, Washington D.C., 1982, p. 1-1.

18. FM 1-112, pp. 1-1 to 1-2.
19. Ibid., p. 5-8.
20. Based on author's experience as S3, 229th Attack Helicopter Battalion, 101st Airborne Division, S3, 3rd Attack Helicopter Battalion, 3rd Infantry Division, and S3, 4th Brigade, 3rd Infantry Division.
21. FM 1-112, p. 4-7.
22. Ibid., p. 4-7.
23. Ibid., p. 5-8.
24. Ibid.
25. Ibid.
26. Ibid.
27. Army Aviation Cross-Flot Operations, p.6.
28. US Army Aviation Center, White Paper, AH-64 and OH-58C Warfighting Tactics, Techniques, and Procedures, Fort Rucker, Alabama, 1 March, 1989, p. 12.
29. Field Manual 100-2-3, The Soviet Army, Department of the Army, Washington, D.C., 16 July, 1984, p. 5-93.
30. Ibid., p. 5-95.
31. US Army Pamphlet, Soviet Tactical Planning Factors, Fort Leavenworth, Kansas, May, 1989, p. 2-4.
32. Ibid., p. 3-11.
33. Ibid., p. 2-4.
34. FM 100-2-3, pp. 4-58 to 4-60.
35. Ibid., p. 4-60.
36. Ibid., p. 4-94.
37. Ibid., p. 4-34.
38. Ibid., p. 5-101.
39. Ibid., pp. 4-34 to 4-35 and 4-107 to 4-108.

40. White Paper AH-64 and OH-58C Warfighting Tactics, Techniques, and Procedures. p. 20.
41. FM 34-80, Brigade and Battalion Intelligence and Electronic Warfare Operations, Department of the Army, Washington D.C., 15 April, 1986. pp. 2-17 and 2-30.
42. Soviet Tactical Planning Factors. p. 2-16.
43. FM 100-2-3, p. 2-16. Based on 50% of the SAM regiment protecting assets within the two first echelon regiments zone of attack.
44. FM 100-2-3. p. 5-103.
45. TM 55-1520-238-10, Operator's Manual AH-64, Department of the Army, Washington D.C., 15 May, 1987, p. 4-17.
46. Information used to base this conclusion is found in FM 100-2-3, Chapter Five and White Paper Tactics, Techniques, and Procedures, Chapter Three. The conclusion is based on altitude of aircraft (15 meters), airspeed (100+ knots), use of terrain to mask the battalion, and the minimum altitude of the SA-6 (50 meters) and SA-8 (10 meters). These factors combine to create a weakness in the Soviet ADA system that permits the battalion to penetrate without being acquired by all of the Soviet systems.
47. TM 55-1520-238-10 Operator's Manual AH-64, p. 4-16.
48. Ibid., p. 4-18.
49. Ibid., p. 4-19.
50. FM 100-2-3, Chapter Five. Chapter Five explains the employment and capabilities of the Soviet ADA weapons. Fifty percent probability of hit is used throughout the study as a center position favoring neither side. This allows an easier examination of the doctrinal and tactical question rather than a technical comparison. FM 1-112 Chapter Three explains the employment of the attack helicopter battalion.
51. TM 55-1520-228-10, Operator's Manual OH-58, Department of the Army, Washington D.C. 28 April, 1986, p. 2-1.
52. Soviet Tactical Planning Factors, p. 2-4.
53. Ibid., p. 2-4.
54. Ibid.

55. FM 100-2-3, Chapter Five and Soviet Tactical Planning Factors, p. 2-4, and FM 1-112 Chapter Three.
56. Mathematical conclusion reached by comparing the number of weapon systems involved and 50% probability of hit on those aircraft that are able to be acquired.
57. FM 100-2-3, pp. 4-34 to 4-35, and Soviet Tactical Planning Factors, p.2-4. Based on divisional ADA only. Each regiment has four ZSU-23-4 or six 2S6 and four SA-13 or six BMP-2 (each with three SA-16 launchers).
58. White Paper AH-64 and OH-58C, p. 15.
59. Operator's Manual AH-64 p.4-18, and White Paper AH-64 and OH-58C, p.15.
60. Mathematical conclusion reached by comparing the number of weapon systems involved and 50% probability of hit on those aircraft that are able to be acquired.
61. This does not take into consideration the higher survivability capability of the AH-64 and UH-60.
62. FM 1-112, Attack Helicopter Battalion, p. 3-1.
63. White Paper AH-64 and OH-58C, p. 15.
64. Grimsely, Turner E. Army Aviation, "The LHX Force Structure", 30 November, 1989. p. 20. The Army initially developed the OH-58D as a scout helicopter and an artillery observer platform. The aircraft failed to meet Army test requirements for scout tasks and the decision was made to proceed with fielding for the artillery role. Further testing validated the OH-58D in the scout role but budget constraints and the Aviation Modernization Plan placed emphasis on procuring the LHX rather than the OH-58D.
65. White Paper AH-64 and OH-58C Warfighting Tactics, Techniques, and Procedures, pp. 12-15. Based on the great difference in airspeed and ability to see in the two aircraft.
66. Based on author's experience as an OH-58 and NVG qualified aviator.
67. TM 55-1520-228-10, Operator's Manual OH-58, Chapters 2, 3, 4. These three chapters explain in detail the helicopter systems, avionics, and mission equipment. No mention is made of designation equipment as part of these chapters. This point is confirmed by the author's over 500 hours of flight experience in the OH-58 series aircraft.

68. Technical Manual 55-1520-238-10, AH-64 Operators Manual, Department of the Army, Washington D.C., 27 May, 1987, p. 4-47.
69. White Paper, AH-64 and OH-58C, p. 14.
70. Ibid., p. 15.
71. Ibid., p. 15.
72. The aircraft that will be acquired are the AH-64s that are performing as scouts. Attack aircraft will use standoff and terrain masking to protect themselves from engagement from the enemy.
73. White Paper AH-64 and OH-58C, App. B.
74. Ibid.
75. Ibid.
76. Ibid., p. 8.
77. Based on two AH-64 carrying 8 Hellfire missiles. Each engagement requiring two minutes, one minute per engagement for the scout to reposition, and one minute to acquire a new target.
78. Generally agreed upon conclusion reached by Seminar One, Advanced Military Studies Program in discussions with Professor Jim Schneider on the Moral aspects of war and its effects on unit cohesion.
79. This is an assumption by the author. The assumption attempts to take into consideration the technical capabilities of acquisition systems, weapon capability, and the intangible factors of fog and friction.
80. White Paper AH-64 and OH-58, p. 14. Each attack aircraft normally carries eight Hellfire missiles.
81. FM 100-2-3., p. 5-93.
82. Based on the attack battalion destroying thirty two enemy tanks per mission while suffering the three to seven losses of AH-64s per mission. The attack battalion becomes combat ineffective prior to the ITR.

BIBLIOGRAPHY

BOOKS

- Dorr, Robert F., Skyraider, New York: The Up and Coming Publishing Company, 1988.
- Foss, Christopher F., Jane's Armour and Artillery, Alexandria, Virginia: Jane's Information Group, 1988.
- Mersky, Peter B. and Polmar, Norman., The Air War in Vietnam, Annapolis Maryland: The Nautical and Aviation Publishing Company of America, 1981.
- Mrozck, Donald J., Air Power and the Ground War in Vietnam, Maxwell Air Force Base, Alabama: Air University Press, 1988.
- Walker, J.R., Air to Ground Operations Volume II, McLean Virginia: Pergamon-Brassey's International Defense Publishers, 1987.
- Wolf, Richard I., USAF Basic Documentation Roles and Missions, Washington D.C.: United States Air Force, 1987.

MANUALS

- Field Circular 100-26, Air Ground Operations. Fort Leavenworth, KS: U.S. Army Command and General Staff College, 1984.
- Field Manual 1-111, The Aviation Brigade. Washington D.C.: HQ Department of the Army, 1985.
- Field Manual 1-112, The Attack Helicopter Battalion. Washington D.C.: HQ Department of the Army, 1986.
- Field Manual 1-140, Helicopter Gunnery. Washington D.C.: HQ Department of the Army, 1986.
- Field Manual 24-1, Combat Communications. Washington D.C.: HQ Department of the Army, 1985.
- Field Manual 34-1, Intelligence and Electronic Warfare Operations. Washington D.C.: HQ Department of the Army, 1987.
- Field Manual 34-80, Brigade and Battalion Intelligence and Electronic Warfare. Washington D.C.: HQ Department of the Army, 1986.

Field Manual 44-1-2, Air Defense Artillery. Washington D.C.: HQ Department of the Army, 1984.

Field Manual 100-2-1, Soviet Army. Washington D.C.: HQ Department of the Army, 1984.

Field Manual 100-5, Operations. Washington D.C.: HQ Department of the Army, 1976.

Field Manual 100-5, Operations. Washington D.C.: HQ Department of the Army, 1986.

Field Manual 100-15, Corps Operations (Coordinating Draft). Fort Leavenworth, KS: U.S. Army Command and General Staff College, 1988.

Field Manual 100-103, Army Air Space Command and Control in a Combat Zone. Washington D.C.: HQ Department of the Army, 1987.

REPORTS

U.S. Army Report, Tactical Mobility Requirements Board Final Report. Fort Bragg, North Carolina: Tactical Mobility Requirements Board, 1962.

U.S. Army Report, Air Mechanization. Carlise Barracks, Pennsylvania: U.S. Army Combat Developments Command, 1968.

U.S. Army Report, Air/ Ground Cavalry 1980-1985 Volume I. Fort Leavenworth, KS: U.S. Army Combined Arms Combat Development Activity, 1979.

U.S. Army Report, Division 86, Final Report. Fort Leavenworth, KS: U.S. Army Combined Arms Combat Development Activity, 1981.

Field Circular, The Army of Excellence, Fort Leavenworth, KS: U.S. Army Combined Arms Combat Development Activity Force Design Directorate, 1984.

THESIS

Curran, John M. Command and Control of the Third Tier of Mobility, Combat Aviation, Monograph, School of Advanced Military Studies, Fort Leavenworth, Kansas, 1985.

Mixon Robert W. Jr, Taking the Ultimate Risk: Commanding and

Controlling Maneuver Forces in Tactical Deep Operations,
Monograph, School of Military Studies, Fort
Leavenworth, Kansas, 1986.

Pearson, Craig H. Joint Army Aviation/Air Force Deep Op-
erations at Night: Is it Tactically Feasible and if so
How? Monograph, School of Advanced Military Studies,
Fort Leavenworth, Kansas, 1985.

Runals, Stephen E. Command and Control: Does Current U.S.
Army Tactical Command and Control Doctrine meet the
Requirements for Today's High Intensity Battlefield?
Monograph, School of Advanced Military Studies, Fort
Leavenworth, Kansas, 1985.

PAMPHLET

U.S. Army Pamphlet. Soviet Tactical Planning Factors, Fort
Leavenworth, Kansas: U.S. Army Command and General
Staff College, 1989.

PAPERS

U.S. Army Aviation Center Paper, White Paper, AH-64 and
OH-58C Warfighting Tactics, Techniques and Procedures, Fort
Rucker, Alabama, 1 March, 1989.

MAGAZINES

Harris, William R., Editor, Army Aviation, Westport CT.